

FIG 1

add constraint

budget

min/max qty

precedence

linear

item	bid value	status
1	93	SELECTED
2	43	UNSELECTED
3	21	SELECTED
4	17	UNSELECTED
5	29	UNSELECTED

basic bid data

edit constraint

Set	budget
1, 2,3	120
3,4,5	50

budget constraints

add bid

item	precedence set
3	1
3	2,4

precedence constraints

min qty	set	max qty
2	1,2,3,4	
	2,4,5	2

quantity constraints

item	coef	coef
1	10	10
2	10	-10
3	20	10
4	40	-10
5		10
total	60	20

linear constraints

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FIG 2a

add constraint

- budget
- min/max qty
- precedence
- linear

edit constraint

add bid

item	bid value	status
3	43	UNSELECTED
4	29	SELECTED
5	31	SELECTED
6	12	SELECTED
7	17	UNSELECTED

basic bid data

Set	budget
5,6,7	50

budget constraints

item	coef	coef
3	20	15
4	30	18
5	21	13
6		17
7	30	14
total	50	48

linear constraints

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FIG 2b

Fig. 3a (numeral 34)

$$\text{Max } 93x_{1,1} + 43x_{1,2} + 21x_{1,3} + 17x_{1,4} + 29x_{1,5} + 43x_{2,3} + 29x_{2,4} + 31x_{2,5} + 12x_{2,6} + 17x_{2,7}$$

$$\text{Subject to } x_{3,1} + x_{3,2} \leq 1$$

$$x_{4,1} + x_{4,2} \leq 1$$

$$x_{5,1} + x_{5,2} \leq 1$$

$$93x_{1,1} + 43x_{1,2} + 21x_{1,3} \leq 120$$

$$21x_{1,3} + 17x_{1,4} + 29x_{1,5} \leq 50$$

$$x_{1,2} + x_{1,4} + x_{1,5} \leq 2$$

$$2z_{1,1}^{Min} \leq x_{1,1} + x_{1,2} + x_{1,3} + x_{1,4}$$

$$x_{1,1} \leq z_{1,1}^{Min}$$

$$x_{1,2} \leq z_{1,1}^{Min}$$

$$x_{1,3} \leq z_{1,1}^{Min}$$

$$x_{1,3} \leq z_{1,3,1}^P + z_{1,3,2}^P$$

$$z_{1,3,1}^P \leq x_{1,1}$$

$$2z_{1,3,2}^P \leq x_{1,2} + x_{1,4}$$

$$10x_{1,1} + 10x_{1,2} + 20x_{1,3} + 40x_{1,4} \leq 60$$

$$10x_{1,1} - 10x_{1,2} + 10x_{1,3} - 10x_{1,4} + 10x_{1,5} \leq 20$$

$$31x_{2,5} + 12x_{2,6} + 17x_{2,7} \leq 50$$

$$20x_{2,3} + 30x_{2,4} + 21x_{2,5} + 30x_{2,7} \leq 50$$

$$15x_{2,3} + 18x_{2,4} + 13x_{2,5} + 17x_{2,6} + 14x_{2,7} \leq 48$$

$$x_{1,1}, x_{1,2}, x_{1,3}, x_{1,4}, x_{1,5} \in \{0, 1\}$$

$$x_{2,3}, x_{2,4}, x_{2,5}, x_{2,6}, x_{2,7} \in \{0, 1\}$$

$$z_{1,1}^{Min}, z_{1,3,1}^P, z_{1,3,2}^P \in \{0, 1\}$$

Fig. 3b (numeral 36)

$$\text{Max } 29y_{1,1} + 114y_{1,2} + 60y_{1,4} + 72y_{1,5} + 46y_{1,6} + 153y_{1,7} + 165y_{1,8} + 139y_{1,9} + \\ 43y_{2,1} + 29y_{2,2} + 31y_{2,3} + 12y_{2,4} + 17y_{2,5} + 55y_{2,8} + 60y_{2,9} + 60y_{2,10} + 41y_{2,11} + 104y_{2,14} + 72y_{2,15}$$

Subject to $y_{1,1} + y_{1,2} + y_{1,4} + y_{1,5} + y_{1,6} + y_{1,7} + y_{1,8} + y_{1,9} \leq 1$

$$y_{2,1} + y_{2,2} + y_{2,3} + y_{2,4} + y_{2,5} + y_{2,8} + y_{2,9} + y_{2,10} + y_{2,11} + y_{2,14} + y_{2,15} \leq 1$$

$$y_{1,2} + y_{2,1} + y_{2,8} + y_{2,9} + y_{2,14} + y_{2,15} \leq 1h$$

$$y_{2,4} + y_{1,6} + y_{1,7} + y_{1,9} + y_{2,2} + y_{2,10} + y_{2,11} + y_{2,14} \leq 1$$

$$y_{1,1} + y_{1,5} + y_{1,6} + y_{1,8} + y_{1,9} + y_{2,3} + y_{2,10} + y_{2,14} \leq 1$$

$$y_{1,1}, y_{1,2}, y_{1,4}, y_{1,5}, y_{1,6}, y_{1,7}, y_{1,8}, y_{1,9}, y_{2,1} \in \{0, 1\}$$

$$y_{2,2}, y_{2,3}, y_{2,4}, y_{2,5}, y_{2,8}, y_{2,9}, y_{2,10}, y_{2,11}, y_{2,14}, y_{2,15} \in \{0, 1\}$$

The first constraint selects at most one proposal from player 1;

The second constraint selects at most one proposal from player 2;

The third constraint selects at most one proposal that includes item 3;

The fourth constraint selects at most one proposal that includes item 4;

The fifth constraint selects at most one proposal that includes item 5;

Constraints for items 1,2,6, and 7 are not required in this example, because only one player bids on each of these items and so the item constraint is implied by the player constraint.

Bid data
Including player constraints

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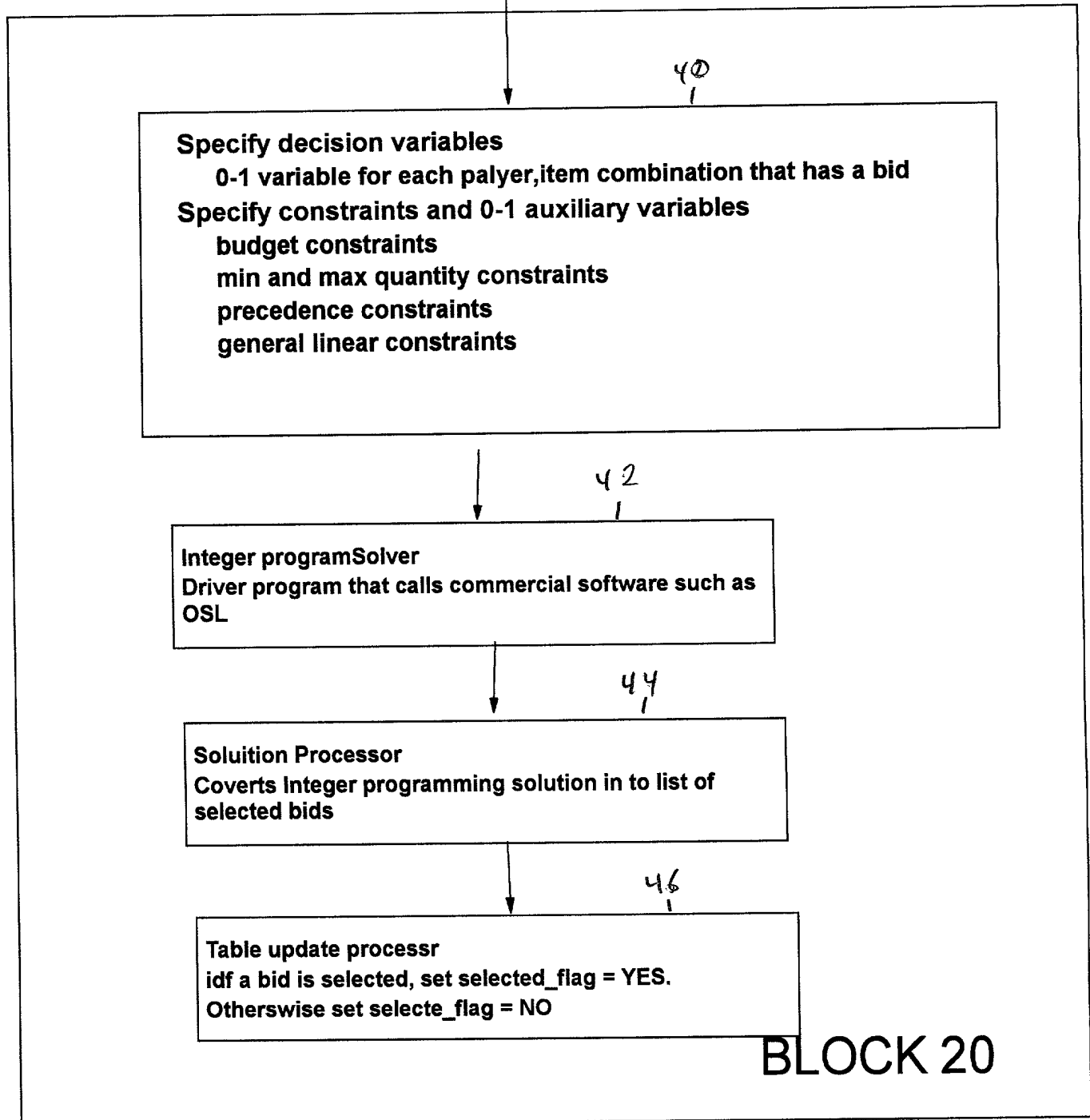


FIG 4

Bid data Including player constraints

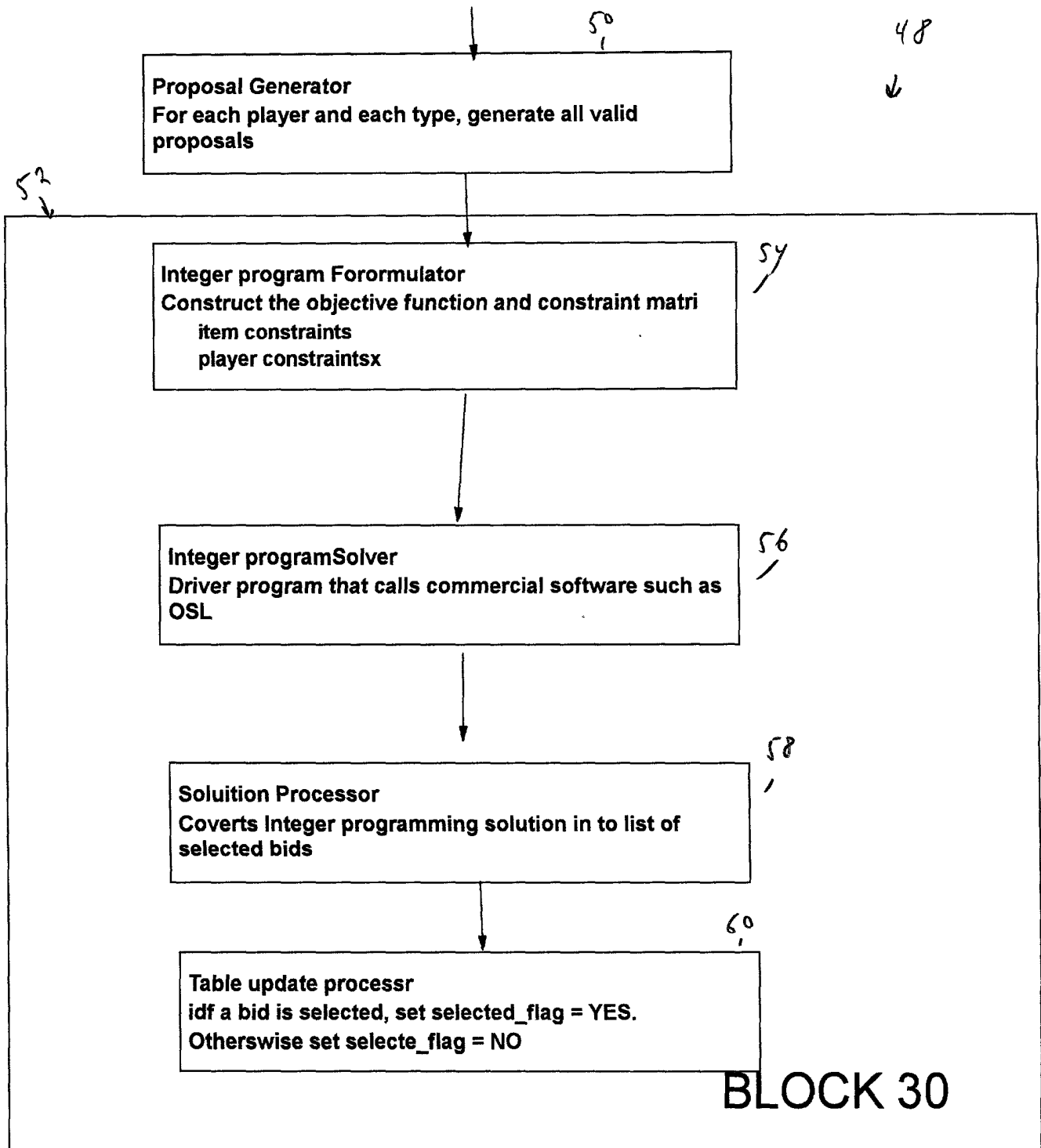


FIG 5

proposal	Items	Value	Reject ?
1	5	29	
2	1,3	114	
3	1,5	122	YES
4	2,4	60	
5	2,5	72	
6	4,5	46	
7	1,2,4	153	
8	1,2,5	165	
9	1,4,5	139	
10	1,2,3,5	182	YES

player 1's proposals

proposal	Items	Value	Reject ?
1	3	43	
2	4	29	
3	5	31	
4	6	12	
5	7	17	
6	3,4	72	YES
7	3,5	74	YES
8	3,6	55	
9	3,7	60	
10	4,5	60	
11	4,6	41	
12	5,6	43	YES
13	6,7	29	YES
14	3,4,5	104	
15	3,6,7	72	

player 2's proposals

FIG 6

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